



# Outstanding image quality in less time

With SmartPath to dStream, Philips is offering a fast and cost-effective way to fully digital MRI

## Who/where

Department of Diagnostic and Interventional Radiology, Marienhospital Stuttgart, Germany<sup>2</sup>

<sup>2</sup> Results obtained by facility described may not be typical for all facilities.

## The challenge

To acquire a system with the latest technology, producing robust and homogeneous image quality, with few artifacts and combined with short examination time, without elaborate reconstruction work.

## The solution

A SmartPath to dStream upgrade turned Achieva into a fully digital system reusing the existing magnet, leading to better images in reduced time and a system that is even easier to operate.

dStream provides digitization of the MR signal directly in the coil at the patient. This increases the signal-to-noise ratio (SNR) by up to 40% compared to Achieva, thus delivering high image quality, high patient throughput, and reduced examination times. Thanks to the channel independence of the digital system, new coils can be easily connected, even at a later stage. The SmartPath to dStream upgrade allows owners of systems from previous generations<sup>1</sup>, such as the Achieva, to take full advantage of digitization.

Back in 2007, the Marienhospital was the first and only hospital in the greater Stuttgart area to acquire a modern 3.0T magnetic resonance imaging (MRI) system, the Achieva 3.0T. In the summer of 2013, the hospital added an Ingenia 1.5T, a fully digital MRI system. In order to enjoy the benefits of digitization with the existing Achieva as well, the hospital decided on a complete SmartPath to dStream upgrade in late 2013: only the magnet of the Achieva 3.0T was retained. Everything else was completely replaced.

The upgraded system is called an Achieva 3.0T dStream and offers the same state-of-the-art technology as the Ingenia. With its two fully digital MRIs – 1.5T and 3.0T – the Marienhospital now offers exceptional MRI capabilities in Stuttgart.



Achieva 3.0T dStream

<sup>1</sup> Intera 1.5T, Achieva 1.5T, Achieva XR, Achieva 3.0T, Achieva 3.0T TX



At the workstation

### Fast upgrade, less downtime

Professor Markus Zähringer, MD, PhD, Medical Director of the Diagnostic and Interventional Radiology Clinic at the Marienhospital in Stuttgart, reports: "The advantage of the upgrade was that it was more affordable than a new system. Because the magnet was retained, we were able to keep everything intact, including the RF cabinets. In addition, the entire upgrade was completed in three weeks, whereas a completely new installation would have meant managing with only one MRI for much longer." By upgrading to Achieva dStream, the clinic can use the 3.0T scanner much

"The main examinations are much faster and less complicated thanks to the integrated coil."

Stefanie Funk, MR technologist

more extensively than previously: "Our focus is on neuroradiological, oncological and musculoskeletal diagnostics, as well as breast and vascular imaging. These are precisely the fields in which the high field strength of 3.0T provides advantages," Professor Zähringer explains. "When we acquired our Achieva 3.0T in 2007, we were well aware in certain clinical areas we had to invest more time to obtain good image quality. Most of these problems have been resolved with the fully

digital scanners – and I am very satisfied with the image quality, which is better in some fields than that of comparable 1.5T systems."

Having a second fully digital MRI is a great asset for the clinicians: "We can basically perform all our examinations equally well on both devices. Even if one of them should fail, we can still offer diagnostics for all clinical areas," Professor Zähringer emphasizes. Having two MRI systems now offers radiologists the opportunity to choose which is the most suitable scanner for their patient – the decisive factor for them is now the magnetic field strength.

### More signal, less noise

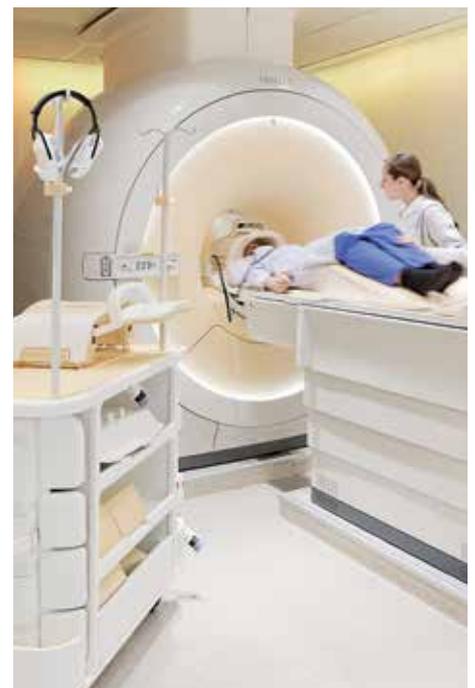
The Achieva dStream provides the benefits of the dStream architecture, that was previously only available with Ingenia. The MR signal is digitized directly in the coil at the patient, i.e. in pure form, and transmitted via fiber optic cable to the computer – for lossless broadband data transmission. This eliminates noise and signal interference that are typical for analog systems and the signal-to-noise ratio increases by up to 40%.

### Easy positioning of the coil, not the patient

The digital dStream coils are much lighter than the analog predecessors, plus the Posterior coil, that is integrated in the table, provides a large patient coverage of up to 2 meters (79"). That is a benefit for both patients and staff. MR technologist Stefanie Funk reports: "Our main examinations are much faster and less complicated due to the integrated Posterior coil." Patients can simply lie down on the table. Laborious positioning is no longer necessary, because the SmartSelect functionality automatically chooses the coil elements that provide the highest SNR. That leads to consistently good images so that up to 60 percent of their examinations can be done without additional coils. In their experience, a whole body scan can be performed in just half an hour, without adding an additional surface coil. Examining the head or the abdomen now takes only a few minutes.

Funk adds: "In addition to the integrated Posterior coil making coil handling much easier, some coils are no longer necessary, such as the spine coil, and the head coil is now only half the size." Thanks to the FlexCaddy, the coils are now close at hand: "We have all the important coils on the FlexCaddy: head, neck, pelvis, leg and abdominal coils are now immediately accessible – which is very practical," Funk explains.

The software now provides many automated functions that save the technologists many mouse clicks, thus saving time. Using dStream also reference scans are no longer necessary. At the same time, Philips has even considered the smallest of details: "We now have access to practical features, such as being able to interrupt the scan without loss of data" Stephanie Funk reports. That takes pressure off patients and staff.



A patient in the system



A spacious examination room in the Marienhospital

## Interview with Professor Markus Zähringer, MD, PhD, Medical Director of Diagnostic and Interventional Radiology at the Marienhospital in Stuttgart

### 1.) What spectrum of services does your department cover?

The range of services in our department is determined by the services offered by the institution as a whole. As a result, we focus on neurological diagnostics because of a large neurology department and also the overall field of oncological diagnostics, including breast diagnostics. The large orthopedic and trauma surgery departments in the institution naturally require musculoskeletal diagnostics. The entire spectrum of vascular medicine and thus vascular diagnostics and interventional radiology are also a focus.

"To summarize, the advantages we see are more homogeneous image quality, a faster examination, fewer artifacts, and enhanced image quality."<sup>2</sup>

Prof. Markus Zähringer, MD, PhD.

### 2.) Why did you decide to upgrade your Achieva?

We wanted an upgrade because we were facing clinical areas that were more difficult to image using a 3.0T system; for example, abdominal or cardiac diagnostics. Thanks to the dStream architecture and the MultiTransmit technology, we no longer have these problems. We can now conduct abdominal imaging and cardiac examinations on both the Achieva 3.0T dStream and the Ingenia 1.5T with excellent image quality. The other reason for the upgrade was scanning speed. Our problem was that our MRI examination times were too long to accommodate the large number of patients. Our Achieva dStream exams are now faster than before on our Achieva, so we can examine more patients in less time.

### 3.) Does Achieva dStream let you conduct examinations that were not possible before?

To be honest, no. But examinations are now considerably easier to conduct and, above all, faster. To explain this, I have to go back a bit. When we chose the Achieva 3.0T MRI scanner in 2007, many people said that a 3.0T scanner would not yet suffice as the only MRI scanner for a hospital of our size. Still, we deliberately decided on this future-oriented technology because of the very competitive situation here in Stuttgart; we wanted to distinguish ourselves from the other hospitals. At that time we had a lot of support from Philips and we have traditionally had clever technologists, who were able to adjust sequences so that even difficult areas such as the abdomen or the heart could be examined with good image quality using our 3.0T system. With the SmartPath to dStream upgrade, everything is now much faster of course, many things are simpler and the image quality is markedly enhanced in some cases.

### 4.) What advantages does fully digital MRI offer you?

Because of the increased signal-to-noise ratio, we either get increased image quality with a scan time comparable to the old system, or the same quality as before in a much shorter examination time. That means that we can handle more patients.

We also benefit from technology such as MultiTransmit, which we regularly use for all examinations. It provides us enhanced image uniformity and consistency, particularly for abdominal examinations. Previously, patients with heavy weight or abdominal fluid were poor candidates for the 3.0T system because of artifacts. These problems have now noticeably been reduced.

To clarify: we received the Ingenia 1.5T in May 2013, and we immediately experienced a marked improvement in abdominal imaging quality compared to our older Achieva 3.0T. With the SmartPath to dStream upgrade, we now have basically the same, if not a slightly better, abdominal image quality as with the 1.5T system.



Conversation with Prof Markus Zähringer, MD

To summarize, the advantages are more homogeneous image quality, a faster examination, fewer artifacts, and better resolution compared to our previous Achieva 3.0T.

### 5.) Are you able to attract more patients to your clinic with these advantages?

We can certainly impress with our image quality. The capabilities we have, specifically through upgrading to Achieva dStream, are unique well beyond the greater Stuttgart area. There are more and more patients who get precise information about which type of imaging makes sense for their illness.

<sup>2</sup>compared to their former Achieva system



They want to know where they can be scanned on a 3.0T system, where to find a Philips reference site with the most modern MRI systems.

#### 6.) What advantages does the Achieva dStream offer you for the future?

The Achieva dStream currently offers us the security of having turned a six-year old MRI into state-of-the-art technology by upgrading, which gives us investment security for the next ten years. Otherwise, in three or four years, we would have had to consider replacing the system completely. The coil concept also plays a role.

The problem used to be that we couldn't retrofit and connect an abdominal coil with 32 channels to a 16-channel MRI, for example. With the plug-and-play option, we can simply integrate new coil technology in the future.

#### 7.) What would you like from MRI in the future?

The stability of the scanners is actually no longer a problem. And if you invest some time, you can now obtain the same image quality as histological sections. Basically, I would like a technology that allows me to shorten the scanning times even further. After all, patients still have to spend up to 30 minutes in the MRI, depending on the examination. For some people that is still very difficult.

## Hospital profile

The Marienhospital is part of "Vinzenz von Paul Kliniken gGmbH" and an academic teaching hospital of the University of Tübingen. The institution is a charitable hospital. The church-sponsored hospital, with approximately 1900 employees, cares for around 31,000 inpatients and 67,000 outpatients per year. This clinic is one of the largest hospitals in the Stuttgart region and has been awarded numerous quality certificates.

As a central facility, the radiological clinic provides the 17 specialist clinics of the institution with the entire spectrum of MRI, x-ray diagnostic imaging, Ultrasound and nuclear medicine examinations, and with minimally invasive image-guided procedures. Modern technology together with a digital image archive and a computer-assisted patient management system enable fast, cost-effective and efficient responses to all clinical questions.

MRI diagnostics includes neuroradiological examinations, imaging of the vascular system and the heart, the outgoing gall ducts, trauma surgery, orthopedic examinations, MR mammography and oncological post-care, including full body imaging.

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